

PATENT CLAIMS

1. Device in a CAN-system (standard ISO 11898), comprising modules (102A, 103A, 104A) which are intercommunicable via a digital serial communication (107A) and in which a control and/or supervisory function can realised from a first module or from a unit (108A), which is communicable with the CAN-system, belonging to one or more second module(s), characterised in that it comprises two or more communication parts (106A, 114A) which form part of the CAN-system, respectively between the CAN-system and the said unit, and which are communicable via one or more wireless connections, in that when a transmission is made from a first communication part (114A) to a second communication part (106A), the parts operate with a signal protocol which takes no account of arbitration and/or confirmation function(s) found in the CAN-system, and in that a particular receiving communication part (106A) executes or assists in conversion of the said signal protocol to the signal protocol of the CAN-system.
2. Device according to patent claim 1, characterised in that the communication parts (204A, 205A) can be coupled to the CAN-system, which in the non-connected-up or non-activated state of the communication parts forms a unitary system (201A) and which in the connected-up or activated state of the communication parts forms two CAN-systems (202A and 205A) which operate separately relative to each other.
3. Device according to patent claim 1 or 2, characterised in that a particular pair of communication parts (204A, 205A) operates with a protocol which is distinct from the CAN-protocol, e.g. Ethernet, Wave-Raider, etc.
4. Device according to any of the preceding patent claims, characterised in that the modules are assigned to weaving machines which are installed in one or more weaving sheds and are respectively allocated one or more modules, and in that the unit comprises a service unit common to a number of weaving machines, preferably the

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majority of the total number of weaving machines, the said service unit preferably comprising or containing a personal computer (PC).

5 5. Device according to any of the preceding patent claims, characterised in that one or more modules assigned to a weaving machine in a weaving shed are arranged such that they are connected via radiocommunication to a service function, which service function comprises or involves beam-changing, bobbin-
10 changing, etc.

6. Device according to patent claim 7 [sic], characterised in that the service function comprises a service machine for the said function, which service machine can obtain up-to-date service function information in parallel with the latter function information
15 appearing on the unit, the function measure or instruction in question being able to be prepared simultaneously or in perfect coordination between the service machine and the staff involved.

20 7. Device according to any of the preceding patent claims, characterised in that the unit provides information on faults occurring to a weaving machine in the weaving shed.

8. Device according to any of the preceding patent
25 claims, characterised in that the production which is attainable with weaving machines in a weaving shed and the service measures which are necessary to the weaving machines in order to maintain effective production can be synthesised with the aid of the unit.

30 9. Device according to any of the preceding patent claims, characterised in that where there are a number of machines (weaving machines) controlled by a common control unit, they are coupled together in a control network in which a particular machine has its own unique
35 control frequency in order to prevent the various machines being disturbed by one another's frequencies.

10. Device according to any of the preceding patent claims, characterised in that the frequencies are chosen within the broad-band range, i.e. 2.4 GHz or above.

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11. Device in a system of mutually separate units, e.g. machines (1101A, 1103A) at a construction site, weaving machines (803A, 804A), etc., which are intercommunicable by means of radiocommunications (115A, 116A), these being able to be set up such that message channels can be realised between two or more of the said units, and in which the radio communications operate with an identification system in which a key allocation can be realised, which in a particular connection instance enables messages to be transferred between selected units only and in which a particular unit is designed with a system operating essentially with a CAN-signal protocol (standard ISO 11898), here referred to as a CAN-system, in which functions, stimulations, readings, etc. in modules (102A, 103A, 104A) making up the unit are intercommunicable via a digital serial connection (107A), characterised in that in each connection instance the key allocation between the units is based not upon the real identity of equipment performing the radiocommunication(s) but upon identity/identities assignable to the equipment, which identity/identities are brought about during coupling by a module in the unit involved and/or from a master system or master control centre.
12. Device according to patent claim 11, characterised in that the respective module concerned (401A) is arranged such that a key-allocation-performing function is built into the module and/or is assignable to the module from a master system or systems (1108A).
13. Device according to patent claim 11 or 12, characterised in that the modules in the CAN-system of a particular unit have unique identities, and in that the unique identity/identities of one or more modules in the CAN-system forms the identity/identities for particular radiocommunication-performing equipment (e.g. 204A, 205A).
14. Device according to any of preceding patent claims 11-13, characterised in that a particular CAN-system comprises a radio module (204A), forming part of

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radiocommunication (115A)-performing equipment, and in that the CAN-system is arranged so as to detect when the radio module is connected or activated, key allocation being able to be realised from another particular module in the CAN-system belonging to the activated or connected radio module.

15. Device according to any of preceding patent claims 11-14, characterised in that the key allocation comprises allocation of a public key, common to CAN-systems incorporated within an area, or a unique key, which therefore is based upon the identity of a module forming part of any of the CAN-systems which communicate by radio amongst themselves.

16. Device according to any of preceding patent claims 11-15, characterised in that the key allocation is carried out by a system node (601A) selected within the CAN-system, which is aware of all nodes forming part of the CAN-system and in which no node can be connected or exchanged or work within the system without the consent or knowledge of the system node.

17. Device according to any of preceding patent claims 11-16, characterised in that the system node determines network keys, the jump plan and/or dispersion codes in the radiocommunications.

18. Device according to any of preceding patent claims 11-17, characterised in that where there are units in the form of a machine, e.g. hoisting crane (1101A) and remote control unit (1104A), the system node in the CAN-system of the machine unit is arranged so as to determine a common key for both units (1101A, 1104A).

19. Device according to patent claim 18, characterised in that the network keys can be distributed exclusively, alternatively or as a supplement from a superordinate level, e.g. via a common communication channel (1107), e.g. in the form of a radio channel, for a number of machines (hoisting cranes) and remote control units (1104A, 1105A, 1106A), the area-common unit having complete information on the identities of all machines and remote control units within a particular area and the

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radiocommunication equipment ending up at a low level from the system viewpoint and being able to be exchanged without any security risks.

20. Device according to any of preceding patent
5 claims 11-19, characterised in that in cases where a number of remote control units (1104A, 1105A) are arranged so as to control a common unit (hoisting crane, weaving machine, etc.), a particular control command from
10 a particular remote control unit is assignable or receivable in an identification device (bit pattern) in the controlled common unit, which identification device is preferably disposed in the system node of the controlled unit.

21. Device according to patent claim 20,
15 characterised in that the control command can be received with the aid of a network key assigned to the controlling unit, and in that the system node selects the control command of a particular remote control unit according to a predetermined set of rules, which allow the remote
20 control units to be connected at different time stages.

22. Device according to any of preceding patent
claims 11-21, characterised in that a number of machine
units (1101A, 1102A, etc.) are assignable to a number of
remote control units (1104A, 1105A) allocated to various
25 individuals, in that where there are non-activated machine units these are arranged so as to listen in on a common channel assigned to a work site (1107A), in that
whenever an idle machine (e.g. 1101A) is assigned to a
remote control unit (e.g. 1104A) (individual) a radio
30 centre establishes contact with the idle machine and transfers the particular identity/keys to the remote control unit, in that whenever the remote control unit is activated the radio part of the idle machine establishes
contact with the radio part of the selected remote
35 control unit via the universal channel (1107A) and reports its identity and the fact that it is master of the connection, and in that an exclusive channel between the machine unit and the remote control can in this case be set up, in which exclusive channel information on the

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jump plan, for example, is transferred.

23. Device according to any of preceding patent claims 11-22, characterised in that the CAN-system is arranged with radio modules (WCANM) (606), the sole task of which is to attend to the wireless radiocommunications.

24. Device according to any of preceding patent claims 11-23, characterised in that a plurality of remote control units (1104A) each serve their own part-area within a work area, and in that, where a mobile unit is controlled by the area, control over the mobile unit is passed from one remote control unit (1104A) to another remote control unit (1105A) as it passes through a part-area border.

15 25. Device according to any of preceding patent
claims 11-24, characterised in that a module comprises a
CPU containing a monitoring/control unit (401A), mem-
ories, a CAN-Controller (404A), a CAN-driver (405A) and
adjustment circuits (406A) for communication via a CAN-
20 connection (407A), which monitoring/control unit can be
coupled together via a connector (416A) to a radio unit
comprising a radio communication part (408A) and a
communication part (409A), the last-named of which
comprises a CPU (410A), memory (411A) and adjustment
25 circuits (412A) for communication.

26. Device according to any of preceding patent claims 11-25, characterised in that where there are a plurality of machines, e.g. weaving machines (803A), which are served by a control desk unit (808A), a machine which requires action sends a message on the wireless network/radiocommunication network, and in that at the control desk unit (808A) one or more items of information appear on the number of machines requiring assistance, the identity of the machines and the nature of the action, etc., a selection facility being provided at the control desk unit for a choice of running order for serving the machines in need of action.

27. Device according to patent claim 26, characterised in that where there is a supervisory

$$\frac{1}{\Gamma(\alpha)} \int_0^t (t-\tau)^{\alpha-1} \frac{d}{d\tau} \left(\frac{1}{\Gamma(\beta)} \int_0^\tau (\tau-s)^{\beta-1} \frac{d}{ds} \left(\frac{1}{\Gamma(\gamma)} \int_0^s (s-u)^{\gamma-1} \frac{d}{du} f(u) du \right) ds \right) d\tau = f(t).$$

~~function from the control desk (808A) all machines make use of the same radio channel and when a selected machine is serviced an exclusive radio channel is established between the selected machine and the control desk unit.~~

28. Device in a CAN-system (standard ISO 11898), comprising modules (1A, 2A, 3A, 4A) which can be connected via a digital serial communication (5A) and in which a function in a first module (1A) and/or equipment unit(s) controlled by this is/are intended to be able to be observed or registered at a location (A) for the placement(s) of the first module (1A) and/or of the equipment unit(s), characterised in that a radiocommunication equipment (8A, 9A) is arranged for connection with a part (9A) belonging to a second module (4A) in the system for the establishment of a radiocommunication channel (11A, 12A) between the first-named location (A) and a location (B) for the placement of the second module (4A), and in that, instead of the placement(s) of the first module and/or of its equipment unit(s), the radiocommunication equipment (8A, 9A) can be activated for initiation (i1) via a radio channel (11A) and the said part (9A) of the radiocommunication equipment by the activation of a signal (i2) in the second module, which signal activation (i2) induces the first module (1A), where there are no faults in the system, to perform its particular control and/or supervisory function, which in this case can be observed or registered at the location for the first module and/or its equipment unit(s).

29. Device according to patent claim 28, characterised in that the CAN-system forms part of a machine-control system and/or a process-control system in which a first signal development (i5) obtains between the modules in the system for the performance of the particular process of the control system, and in that a first activation (i1) of the radiocommunication equipment at the first location (A) gives rise to a second activation of circuits in the second module (4A), and in that the second activation gives rise to the said signal activation (i2) in the second module.

30. Device according to patent claim 9, characterised in that the signal activation (i2) caused by the second activation gives rise to message initiation (19A) in the second module, which prepares for message transmission via the communication circuit (20A) of the module over the connection (5A) to the first module (1A).

31. Device according to patent claim 30, characterised in that the second module transmits the thus generated message (19A) according to a predetermined order of priority in the ordinary exchange of messages or signals (i5) between the modules.

32. Device according to patent claim 31, characterised in that the second module causes an interruption in the ordinary exchange of messages or signals (i5) within the CAN-system, and in that the signal activation (i1) in the second module (4A), initiated by the second activation, takes charge of the generation and dispatch via a communication circuit (20A), the connection (5A) to the first module (1A), of one or more test messages.

33. Device according to any of the preceding patent claims, characterised in that the second module, when a signal is activated (i2) on the basis of the second activation in the second module, imitates a control or supervisory function, which normally can occur in the machine and/or process control, and/or generates a control and/or supervisory control operation which is especially cut out for the testing or fault-searching function.

34. Device according to any of the preceding patent claims, characterised in that the radiocommunication equipment (8A, 9A) operates with two-way connections (11A, 12A) such that a stimulation of a controlled or supervised component or aggregate at the first module (1A) produces a feedback from the first module via the connection (5A) to the second module (4A), whereby an information signal (i3) representing the stimulation is generated, which information signal is transferred to the radio equipment part (9A) situated at the second module,

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information which is transferred in this way via the radiocommunication equipment being indicated or presented on or at the radiocommunication equipment part (8A) at the first module.

5 35. Device according to any of the preceding patent claims, characterised in that those equipment parts which can be observed or registered at the first module comprise components, e.g. valve(s), thermometer(s), etc.

10 36. Device according to any of the preceding patent claims, characterised in that the radiocommunication equipment operates at high frequencies, e.g. frequencies of 2.4 GHz or more.

15 37. Device according to any of the preceding patent claims, characterised in that the radiocommunication equipment part (8A) at the first module (1A) is connected to those control or supervisory equipment part(s) served by the first module.

20 38. Device in a CAN-system (standard ISO 11898), comprising modules (1A, 2A, 3A, 4A) which can be connected via a digital serial communication (5A) and in which a function in a first module (1A) and/or equipment unit(s) controlled by this is/are intended to be able to be observed or registered at a location (A) for the placement(s) of the first module (1A) and/or of the equipment unit(s), characterised in that a radiocommunication equipment (8A, 9A) is arranged for connection with a part (9A) belonging to a second module (4A) in the system for the establishment of a radiocommunication channel (11A, 12A) between the first-named location (A) and a location (B) for the placement of the second module (4A), and in that at the location for the placement of the first module the equipment unit(s) of the module is/are arranged such that they can be stimulated by means of the stimulation, e.g. with electrical and/or manual stimulation, in that the said stimulation initiates the transmission of a message (21A) generated or present in the first module (1A) over the connection (5A) to the second module (4A), and in that the said message hereupon induces activation of the radiocommunication equipment

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